1-1-2007

Soundless Chemical Demolition Agents

Purdue ECT Team
Purdue University, ectinfo@ecn.purdue.edu

DOI: 10.5703/1288284315787

SOUNDLESS CHEMICAL DEMOLITION AGENTS

THE NEED

The traditional approach to demolishing concrete structures or reducing the size of large rocks or boulders has typically included the use of explosives. The resulting explosions are associated with the obvious risks posed by shock waves and fly rock. These problems, along with other detrimental side effects of using explosives, have increased an interest in the use of alternative methods to demolish rock and concrete structures.

FIGURE 1 ROCK DEMOLITION

THE TECHNOLOGY

Soundless chemical demolition agents (SCDAs) have proven to be viable substitutes for the use of explosives. SCDAs are powdery materials that will expand considerably when mixed with water. This expansion, when occurring under confinement, generates significant expansive pressures. These pressures are sufficient to break up rock and concrete when the SCDA is confined in a borehole or a series of boreholes. Experiments have been conducted with SCDAs to learn more about those variables that tend to hamper or change SCDA performance. Results show that the amount of mixing water and the ambient temperature are the most important variables in influencing the generation of SCDA expansive pressures.

The preparatory procedures involved in using SCDAs are similar to those followed in traditional blasting techniques. As with explosives, boreholes must be drilled to contain

http://dx.doi.org/10.5703/1288284315787

the SCDA. Beyond this, however, the similarities diminish. The SCDA must be mixed with a measured quantity of water and poured into the boreholes. It will then begin to hydrate, generating heat and crystallizing while hardening and expanding. If hydration takes place under confinement, significant expansive pressure will result. The pressures can be of sufficient magnitude that, after a period of time, they will fracture the confining material. Depending on the type of SCDA, significant expansive pressure may be generated as quickly as within 15 min., or as long as within 24 hr.

FIGURE 2 DEMOLITION PROCESS

THE BENEFITS

- They do not make noise, explode, or generate fly rock, vibration or toxic fumes. SCDAs are also safer than traditional explosives, which pose the threat of premature explosion and which may misfire, posing a significant threat after the planned explosion. Contrary to explosives, SCDAs produce their destructive forces in rock and concrete by generating significant expansive forces without generating shock waves.
- While there are several advantages to using SCDAs, their relatively high cost makes explosives more cost-effective in many applications. Nonetheless, SCDAs have become a common means of breaking up boulders that have rolled onto remote mountain highways. SCDAs have also been used when excavating rock, or demolishing concrete structures or components of concrete structures near inhabited areas, natural gas lines, roadways or other areas where the use of explosives would pose a significant safety risk.

STATUS

SCDAs are manufactured primarily in Japan, China, Russia, and some countries in Europe. In US, Demolition Technologies Incorporated is distributor of BRISTAR from Onoda Corp., Japan, and Daigh Company is distributor of Fract.AG from Chimica Adile, Italia.

http://dx.doi.org/10.5703/1288284315787

Although the use of explosives remains the principal means by which rock and concrete structures are demolished, there has been and increased use of SCDAs over the past two decades. There is still little standardization surrounding the manufacture and use of SCDAs. In fact, there is not even a consensus as to the proper terminology by which reference should be made to SCDAs. Other terms by which SCDAs are known include soundless cracking agents, expansive agents, expansive concrete, non-explosive demolition agents, and other related variations of these terms.

Barriers

The relatively high cost of SCDAs makes explosives more cost-effective in many applications. This makes the SCDA's market very limited.

Points of Contact

Hinze J., Univ. of Florida
E-mail: hinze@ufl.edu
Brown J., Christofer Brown Assoc.
Melinda Adams, Demolition Technologies, Sales and Marketing
Tel: (800) 282-4384, Fax: (334) 382-0815 Email: demolitiontechnologies.com
Mike Daigh, Daigh Company
Tel: (770) 887-5215, Fax: (770) 887-3783, E-mail: mikedaigh@mindspring.com
Archer Company USA, Inc., Univ. of Florida
Tel: (505) 874-9188 Fax: (505) 874-9108 Email: sales@archerusa.com

References

1. "BRISTAR 2000" Non Explosive Demolition Agent Catalog. ONODA Corporation. Tokyo, Japan
2. Demolition Technologies Incorporated, http://demolitiontechnologies.com/
3. Fract.Ag, http://www.daighcompany.com
4. Hinze Jimmie and Brown James,.Properties of the Soundless Chemical Demolition Agents, Journal of Construction Engineering and Management, Vol.120, No. 4, December, 1994.

Reviewers

Peer reviewed as an emerging construction technology

Disclaimer

Purdue University does not endorse this technology or represents that the information presented can be relied upon without further investigation.

http://dx.doi.org/10.5703/1288284315787

PUBLISHER

Emerging Construction Technologies, Division of Construction Engineering and Management, Purdue University, West Lafayette, Indiana

http://dx.doi.org/10.5703/1288284315787